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A SUCCESSFUL NEW YORK FARM.

BY

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., March 13, 1911.

SIR: I have the honor to transmit herewith a paper entitled "A Successful New York Farm," by Mr. M. C. Burritt, scientific assistant, prepared under the direction of the Agriculturist in Charge of the Office of Farm Management. I recommend that this be published as a Farmers' Bulletin.

Respectfully,

WM. A. TAYLOR,
Acting Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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A SUCCESSFUL NEW YORK FARM.

INTRODUCTION.

Twenty years ago farming in New York State did not offer the inducements which it now holds out. The prices of farm crops were low and land values were on the decline. The temptation for a young man who had the opportunity to go to the city and seek employment there was very great. The following is the story of a plain New York farmer who did not take this opportunity, but who remained on the farm to work out its problems, even in the face of unfavorable conditions. The farm in question was a very ordinary one located in Monroe County, in western New York, and the circumstances under which the farmer began business were those so common in the East at the time. The farm mortgage, notes to dealers for machinery and to neighbors and others for stock, the general disorganization of the farm, with its poor fences, poor drainage, more or less run-out land, and many other similar accompanying circumstances, were all present.

Mr. T. E. Martin, though born and reared on a farm, had no liking for agricultural pursuits, and in his early life did not expect to become a farmer. On the other hand, his desire was to become a civil engineer or a mechanic, but through force of circumstances he drifted into farming on the land which his father and his grandfather had tilled before him. He was denied the privilege of more than a common-school education and was forced to begin farming under many handicaps. He took up the problem with characteristic energy, however, and the results of 18 years of his management are set forth in the following pages. This account is offered as evidence of what can be accomplished by applying systematic methods to the farm and by thorough organization of the business. These two factors, businesslike methods and organization, are the ones which stand out in the history of this New York farm. A measure of what has been accomplished may be found not only in the success of the farm itself but also in the fact that the owner has been called to the management of the demonstration farms of a large railroad company.

NOTE.—A list giving the titles of all Farmers' Bulletins available for distribution will be sent free upon application to a Member of Congress or the Secretary of Agriculture.

HISTORY OF THE FARM.

The farm, which then consisted of 57 acres of land, was purchased in April, 1892, for \$5,000. It was necessary to give a mortgage of \$3,000 upon the place at the time. The purchaser had a wagon, a single carriage, a sleigh, harnesses, three horses, one cow, and some other equipment. He was obliged to go in debt to the extent of about \$250 for such other necessary tools as plows, harrows, drags, a potato digger and planter, a weeder, and a hand cultivator. In addition to this, his note was given for three cows. The buildings on the place were fair to good and very much the same as they are at the present time. The fences were constructed of rails and stone; at least one-fourth of the farm was waste land, swamp, pasture, etc. (Figs. 1 and 3.)



FIG. 1.—A part of the farm in 1892, showing its unimproved condition at that time.

The task of the first few years was to clear away the old fences and to divide the farm into fields of more regular shape. The last fence went in 1900. Probably 1,200 yards of stone have been removed from the land and fence rows during 17 years. Several hundred stumps were removed during the first six or eight years, and this, together with the removal of the stone, added considerably to the available tillable area. The drainage, which was begun very early, also added more tillable land. An account of this drainage will be given later.

The first few years was a period of constant struggle under most discouraging conditions. The income from the farm was scarcely sufficient to pay the expenses and the notes which were given for equipment at the time of beginning farming operations. From time to time it was necessary to add to the equipment, and other

notes had to be given; for example, \$235 for two horses in 1893. The income from the butter made from three cows, together with the egg money from the chickens, was mostly required to keep the family in groceries and other household necessities. If these funds purchased the clover seed in addition the owner considered himself fortunate. Potatoes formed the real money crop from the first and, together with some wheat and buckwheat, were the chief source of income.

From 1892 to 1900 extremely low prices prevailed, forming a great handicap to successful farming and farm improvement. During this period potatoes sold as low as 8 cents a bushel, wheat as low as 48 cents a bushel, rye 32 cents a bushel, eggs 10 cents a dozen, butter 13 cents a pound, and lard 6 cents a pound, these figures being taken from the owner's books.

These were times when small failures or successes counted for much; when, for example, the failure of a hatch of chickens meant curtailing the grocery bill and when a shortage in the potato crop meant failure to meet notes which were pressing to be paid. But the owner never lost sight of the ideal which he had in mind, and every effort was bent toward increasing the area devoted to the money crop and increasing the yield of every acre of this area. A systematic rotation of crops was early adopted and the fertility of the soil was not only maintained but increased. It was not long before this policy began to count. Each year saw a little more of the debt wiped out and a little more added to the equipment of the farm and hence to its productive power. These methods were continued until the indebtedness was entirely paid, the drainage system on the farm completed, and many comforts and conveniences added to the farm.

ORGANIZATION OF THE FARM.

The one thing which stands out above all others on this farm is its thorough and complete organization for business. A rotation of crops was begun at the very first. This consisted of wheat, followed by clover and timothy, mostly the latter, fodder corn, potatoes, and buckwheat. At first this rotation was more or less irregular, but an effort was made all the time to get the fields into shape for a fixed four-year rotation. This was begun about 1895. It consisted of (1) rye, (2) clover and timothy hay, although the clover did not catch well at this time, (3) potatoes followed by rye, which was plowed under in the spring and followed by (4) potatoes again. This rotation was intended to be the ultimate one, but as it failed to maintain the potato yields it had to be abandoned. Rye was used in this rotation until 1898, when wheat was substituted on account of its larger yield and higher price. In 1899 the rotation was shortened to three years and made the simple

one of wheat, clover, and potatoes. By this time the farm was pretty well cleared of stumps and fences and the whole thrown into three large fields where the three-year rotation was regularly and systematically followed. (Figs. 2 and 4.)

The direct result of these business methods of organization was a farm with definite fields, a definite rotation carefully followed every year, and a complete drainage system. This result did not come about in any casual manner, but was brought about entirely by a well-developed plan systematically followed from the very first, being modified as circumstances demanded.

When the farm was well organized and making good returns, attention was turned to that part of the business which, while it did not show as large returns from a dollar standpoint, still added very much



FIG. 2.—The farm as it appeared in 1903, showing wheat in the foreground, next clover hay, with potatoes in the background. The left side of the wheat and clover fields is identical with the location shown in figure 1.

to the efficiency, convenience, and comfort of the owner and his family. One of the most complete sets of small tools for the repairing of farm equipment which was ever brought together on a farm was collected and systematically arranged. This has proved to be of the greatest value in the repairing of farm equipment and in the making of various minor but necessary articles on the farm. The garden was the next part of the business to receive attention, and this was as systematically organized and planned as if it were yielding a large income in cash. These two items of the organization will be dealt with in more detail in the latter part of this bulletin.

The most remarkable thing about this farm is not that any one of the many things has been done so well, but that so many things have been done well. It is very unusual to find a farmer who, without much

capital, has made a model garden and orchard which would do credit to a man of wealth, assembled a model small-tool equipment, put in an excellent tile drainage system, and who at the same time has grown nearly maximum crops and made a good profit or interest on his investment.

DRAINAGE.

Probably the most important factor in the increased productiveness of this farm is the thorough system of tile drainage which has been put in operation. The soil, which varies from a loam to clay loam and gravel loam (Dunkirk series), with a stony clay and hardpan subsoil, lies partly on a gentle eastern slope and partly on a rather level area bordering a small stream which runs through the farm. About half of the land has fairly good surface drainage and the other half poor to

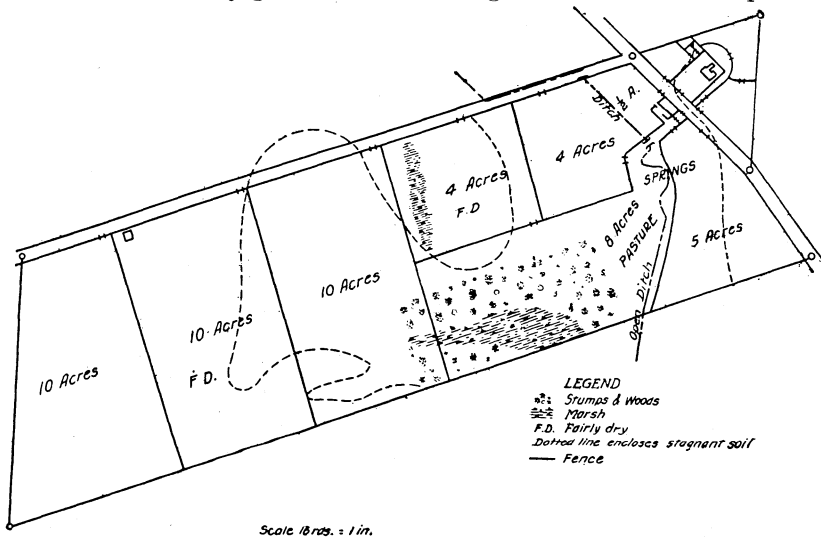


FIG. 3.—Diagram of the farm as it appeared in 1892, showing the location of the fields, etc.

very poor. (Figs. 3 and 4.) In these respects it did not differ materially from many other farms in the neighborhood and throughout this section of the country.

In 1892, when the place was purchased, some 2 miles of stone drain had been laid. The drains were very shallow, however, and were mostly stopped up. In 1894, while the owner was still heavily in debt, tile draining was begun, and during that year about 2 miles were laid. It was necessary to give a note for the carload of tile which was used in this first drainage. The owner's friends began to doubt his sanity. Probably \$250 altogether were expended in this drainage during the first year. In 1895, 2 additional miles of tile were laid. This year the potato market went to pieces, potatoes selling as low as 15 cents a bushel, and in 1896, with neither money

nor credit, it was impossible to continue the drainage. That year attention was turned to stump pulling and the clearing of waste land. The next year, however, the drainage was resumed and 200 rods of drain were laid, making a total of 1,400 rods. Between 1898 and 1909 the general plan of laying as much drain as possible during each year was followed. At the present time there are 3,200 $\frac{1}{2}$ rods, or one-half rod more than 10 miles of drain, on the 57.85¹ acres which now comprise the farm. (Fig. 5.)

From the very first, a complete system of drainage was planned for the farm and, while the tile first laid were put in the lower parts of the farm where drainage was most needed, the future development of the system was kept in mind and large sewer pipes were used so

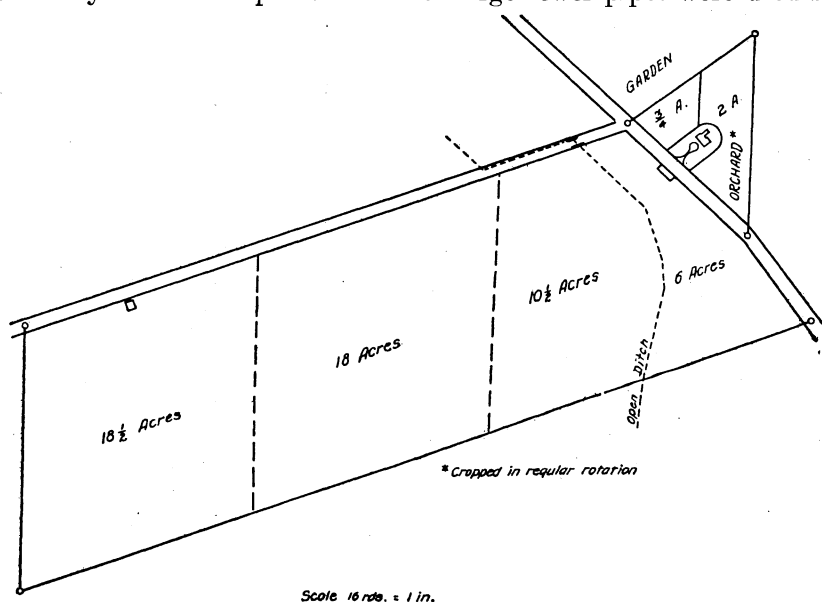


FIG. 4.—Diagram of the farm in 1908, showing the location of the fields, etc., after reorganization.

that these could later serve as mains in the system. As early as 1897 and 1898 a systematic plan of drainage was outlined for the farm and was thereafter followed.

The draining was usually done on plowed land where potatoes were to be planted. If it was not possible to do it in the fall or the following spring before planting, the tile were laid right through the potato field later in the season. It was the practice to locate a pair of drains, side by side or alternate ones, and set a line of small stakes over them. A man with a team then opened a dead furrow, which was shoveled out, the ground replowed, and the furrow reshoveled until 2 to 2 $\frac{1}{2}$ feet deep. The remaining depth was dug by hand,

¹ A small strip of land, 0.85 of an acre, was purchased in order to enlarge and perfect the shape of the garden and orchard.

using modern drainage tools, such as 18-inch drain spades, narrow cleaning shovels, double-end tile scoops, pickaxes, etc. The lateral drains are usually 55 feet apart and preferably 4 to 4½ feet deep. The plowed portion of the ditch was about 18 inches wide, but the remainder was narrowed down to tile size. The soil removed from this pair of drains was thrown out on the left bank of one and the right bank of the other for economy in plowing in, the team going up one side and down the other. After the tile were laid and the joints carefully covered, the ditch was filled in with a plow. The tile used in the system vary from 3 to 12 inches in diameter, the main for the west-side system being 8 inches in diameter.

A fair estimate of the cost of laying the tile in this system under average conditions is 50 cents per rod, including the tile and the labor of laying. Figuring the owner's time at \$2.50 a day and day labor from \$1 to \$1.50, the tile at \$12 to \$15 a thousand for the 3-inch size, etc.,

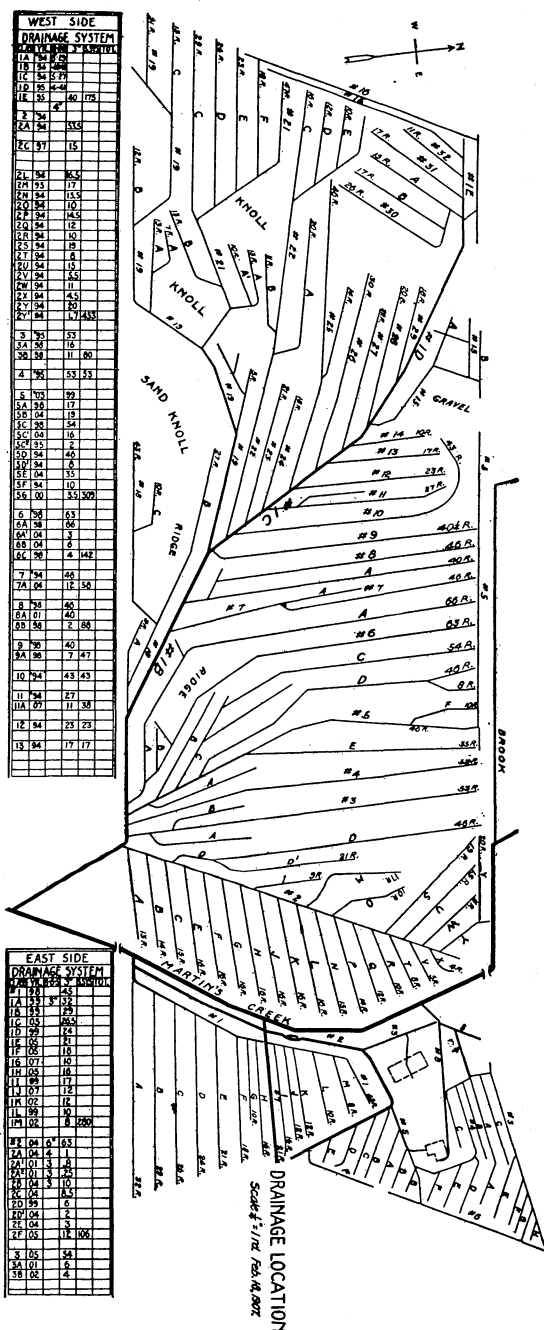


FIG. 5.—Drainage map of the farm, showing the location of all drains. The key shows in part the size and location of tile, with date of laying.

brings the probable cost of the system up to about \$1,600. Some extra work, such as cutting through a knoll, added \$400 more. In addition to this, the cost of obtaining an easement through adjoining property and the digging of a 4½-foot ditch through marsh and woodland, 233 rods in length, for an outlet was about \$500, so that approximately \$2,500, or half of the original cost of the farm, has been expended in tile drains in 15 years. In addition, this outlet ditch has to be cleared out every year at an average expense of about \$50 a year.

Probably the most convincing argument and the best proof of the value of drainage is the presence of flourishing, nearly maximum crops on land that was formerly sour, boggy, and marshy. This is well illustrated in figure 2.

CROPPING SYSTEM FOLLOWED.

As previously stated, the rotation now followed is the simple one of wheat, clover, and potatoes. This has several advantages. In the first place it is a short rotation, each of the crops coming once in three years on the same land. Then the potato crop is a strong money crop, the wheat a fairly good one, and the clover an excellent crop for maintaining fertility. Moreover, it is necessary to plow but once in three years. Perhaps the greatest difficulty with this rotation is that in some years the potato crop is so late in harvesting that it is not practicable to get the wheat in early enough to get sufficient growth to carry it safely through the winter, and the wheat crop is often light on this account. The table on page 13 shows that there is a direct relation between the date of seeding and the yields, earlier seedings giving better yields than later ones.

The clover is sown in the wheat in the spring and covered with a spike-tooth harrow. The first crop of clover is harvested and fed to the work horses and the two cows. The second crop is usually mowed and left on the ground. This crop, together with the later growth, is plowed under in the fall. Potatoes are put upon this land the third year, the aim being to plant as early as possible in the spring so as to get a crop off in time for wheat.

W H E A T .

PREPARATION OF THE LAND.

The wheat crop follows potatoes. As soon as the potatoes are harvested the vines are raked up with a hayrake and burned. In order to make a clean job, the field is first raked lengthwise and then across. When the field is clean, a double-action cutaway harrow is run straight or diagonally across the potato rows. This harrow is the 7-foot size, has twenty-eight 16-inch disks, and requires four horses. The spring-tooth harrow is then run diagonally over the field to level the ground, concluding the preparation.

SOWING.

The sowing is done at right angles to the prevailing winds, so that the rows may catch and hold the snow. A grain and fertilizer drill with hoes 7 inches apart is used. The variety of wheat sown is Klondike, a white, beardless wheat with a stiff straw. The date of seeding has varied from October 1 to October 30, rather later than most seeding in this section. For the last 12 years the average date has been October 13.

HARVESTING.

The grain is cut with a self-binder having a 6½-foot cut and is shocked in the field. Harvesting is not begun until the grain is dead ripe. As soon as the berry is dry it is thrashed in the field after the western method, being hauled directly from the shock to the machine. The straw is stacked in the field; the grain is drawn to the barn and sometimes sold immediately, sometimes held until later in the winter, depending on the condition of the market. No straw is sold from the farm. What is necessary for the bedding of two cows and four horses is hauled to the barn; all the rest is spread on the hay stubble in the fall and plowed under for potatoes the following year.

YIELDS.

The yield of wheat is usually dependent upon how early the potato crop of the previous season is harvested and upon the succeeding winter. Because of the lateness of seeding the average yield is not usually large, being 25½ bushels per acre for 12 years. In the fall of 1908 the wheat was sown about October 1, and the yield in 1909 was 45 bushels per acre from the entire 18 acres. In 1909 wheat was sown October 14 and yielded 34 bushels per acre in 1910. The yield for the last six years averages 5½ bushels per acre greater than that of the previous six years. Table I presents in a convenient form the facts as to date of sowing and yield to the acre for 12 years.

TABLE I.—*Yields of wheat on the farm for 12 years, 1899 to 1910, inclusive.*

Years.	Date of sowing, previous fall.	Acres.	Yield per acre. ¹	Years.	Date of sowing, previous fall.	Acres.	Yield per acre. ¹
			<i>Bushels.</i>				<i>Bushels.</i>
1899.....	Nov. 4	18½	8.1	1905.....	Oct. 19	18	24.7
1900.....	Oct. 10	18	18.8	1906.....	Oct. 7-13	18	22.7
1901.....	Oct. 6	18	18.0	1907.....	Oct. 16	18	24.3
1902.....	Oct. 8	18	34.0	1908.....	Oct. 19	18	18.3
1903.....	Oct. 3	18	40.0	1909.....	Oct. 1	18	45.0
1904.....	Oct. 17	18	19.0	1910.....	Oct. 14	18	34.0
6-year average.....			23.0	6-year average.....			28.2

¹ Average for 12-year period, 25.6.

CLOVER.

SEEDING.

Two quarts of timothy are sown at the time of the wheat seeding in the fall. Formerly 7 quarts were used, but since clover has become a more certain crop the proportion of timothy has been decreased. The greatest care is used to get clean seed, and no expense is spared to procure the very best. In the spring the clover seed is sown. The quantity used prior to 1907 was about 17 pounds per acre, somewhat less than now, the tendency having been to increase the amount of clover sown each year. In the spring of 1907 alfalfa was added to the clover. That year 20 pounds of clover and $6\frac{3}{4}$ pounds of alfalfa were sown per acre. In 1908 and 1909 the seedings were the same, being the first use of alfalfa on each of the fields in rotation. In 1910 (beginning the second cycle of the rotation since alfalfa was first sown) the seeding was 15 pounds each of clover and alfalfa. In the third cycle (1913) the seeding will be three-fourths alfalfa and one-fourth clover, the idea being to substitute alfalfa entirely for clover in this rotation by the time the fourth cycle (1916) of the rotation is reached. The seed for the 18-acre field, which in 1909 was $6\frac{1}{2}$ bushels of red clover and $2\frac{1}{2}$ bushels of alfalfa, was divided into 18 equal parts and each acre's portion was separately and thoroughly mixed in a metal bushel basket. Care was used to see that each acre received its proportionate quantity of 30 pounds, this being carried to the field in a separate bag.

The seed was sown in the wheat field with a broadcasting seeder which covers four drill widths at a passage. The usual time of seeding is between April 1 and 10, and is determined by the conditions. The most favorable time is thought to be when the ground is fairly dry, preferably in the afternoon when the surface is most opened up by evaporation. The next forenoon the ground is harrowed with a lever-set, sharp, spike-tooth harrow, the teeth being set straight. Each section of this harrow weighs about 100 pounds. Preferably the harrow is run across the drill rows in order to cover the seed as well as possible. Great emphasis is placed on the complete covering of seed and no pains are spared to do this. Formerly seeding was done on a honeycombed surface cracked open by frost in the early morning, but it was later found that this condition was prevented by drainage and that the seed did not germinate well, owing to its not getting into the soil.

After wheat harvest the wheat stubble is clipped about 3 to 4 inches high with the mower with the swathing board removed, and the stubble is left on the ground. This gives the young clover plants their best chance to grow and destroys the weeds, especially the ragweed.

HARVESTING.

The mowing machine is started in the field between June 15 and 20. It is expected to have the hay in the barn before July 1, and preferably by June 25. As the alfalfa comes more and more into the rotation the hay will be cut still earlier.

UTILIZATION OF THE CROP.

When a big crop is grown it is cut high and as much of the stubble left as possible. The crop is fed out to two cows, which are stall-fed the greater part of the year, and to the four work horses. In addition, the horse of a friend is kept in hay and straw and the manure hauled back to the farm. The second crop of hay is sometimes cut and hauled to the barn to sell if the price is high, but usually it is cut and left on the ground. A second crop is never removed from the poorer parts of the field. This second cutting is usually made about the first week in August; about September 15 the third cutting is made and left on the ground. This is done because it rots more quickly and because some weeds are prevented from going to seed.

YIELDS.

The yields of hay, of course, vary greatly with the season, but the stand of clover is uniformly a good one. In fact, for the last two years it has been as good as the writer has ever seen anywhere. In 1901 and 1905 the clover averaged 4 tons of cured hay per acre. In 1907 the yield was not quite 2 tons per acre, while 56 tons were cut from 18 acres at the first cutting in 1908. Some hay is sold when the crop is large if there is any surplus, although the quantity sold seldom exceeds \$100 in value.

POTATOES.

PREPARATION OF THE LAND.

In preparing the land for potatoes all the third growth and sometimes the second growth of clover, especially on thin parts of the field, is left on the ground. In addition to this, all the wheat straw except what is used for bedding for the stock is spread on the clover sod in the fall. What manure is made is drawn after haying and spread on the thinner parts of the clover field. All this material is plowed under in the fall. Spring plowing is preferred, but for the last two years, because of economy of time and because of a better rotting of the straw plowed under, fall plowing has been practiced.

In the spring a spring-tooth harrow is first run over the ground, going with the furrows. After this a cutaway harrow is used diagonally across the field in each direction and again at right angles to the furrow, three times in all. The spring-tooth harrow is then used

diagonally across the field to level the surface. One application of fertilizer is made with the grain drill, preferably between the first harrowing and the first time over with a cutaway harrow. The second application is made just before planting. Going over the field twice with a grain drill in this way serves also as cultivations. The roller is used ahead of the planter to insure a uniform planting depth. Any rough or lumpy parts of the field are given extra harrowing and rolling.

SELECTION OF SEED.

A seed plat of about 2 or 3 acres is grown annually in order to provide the next year's seed supply of potatoes. This plat is put on the best part of the field and where the land is free from scab. The product of this plat is ordinarily about 900 bushels, which are assorted into two grades, "selects" and "specials." "Specials" must weigh not less than three-fourths of a pound each and must have well-developed seed and stem ends, and they must be true representatives of the type and variety, which is exclusively Sir Walter Raleigh. The "selects" are those which do not pass this test, except tubers which are poor in shape or below size, which are discarded and used for food. About 10 days before the potato tops die this plat is carefully gone over and all diseased, dead, poor, or otherwise imperfect hills are dug up and removed from the seed plat. "Specials" are used to plant the seed plat the following year, and these are all treated with formaldehyde. The "selects" are planted in the remainder of the field.

PLANTING.

An automatic planter which opens the furrow, cuts the seed tuber into four pieces, drops and covers each piece, and marks the next row is used for planting. This machine requires one man to drive and another man to feed the seed into the hopper. Potatoes are planted 3 to 4 inches deep, 11 inches apart in the row, with the rows 36 inches apart. Each seed tuber is of marketable size, and about 22 bushels are required to seed each acre, but one piece being used in each hill.

FERTILIZATION.

In 1909 between 1,500 and 1,600 pounds of a home-mixed fertilizer, which analyzed 3.89 per cent nitrogen, 8.33 per cent phosphoric acid, and 13.33 per cent potash, were applied, 1,000 pounds to the acre at the first application and from 500 to 600 pounds at the second. The source of the nitrogen in this fertilizer is nitrate of soda, dried blood, and fresh ground bone. The source of the potash is the sulphate, while that of the phosphoric acid is ground bone and rock. The quantities used, with the percentage of each, are shown in Table II.

TABLE II.—Quantities of home-mixed fertilizer used for each acre of potatoes, with the percentage of nitrogen, phosphoric acid, and potash it contained and the source from which each constituent was derived.

Fertilizer constituent.	Fertilizing material.		Fertilizer constituent in material used.	
	Source.	Pounds used.	Per cent.	Pounds.
Nitrogen.....	Nitrate of soda.....	4,000	15.8	632
Do.....	Dried blood.....	4,000	9.8	392
Do. ¹	Fine, pure ground bone.....	6,000	2.4	144
Phosphoric acid ¹	do.....	6,000	23.1	1,386
Do.....	Treated rock.....	8,000	14.0	1,120
Potash.....	Sulphate of potash.....	8,000	50.0	4,000
Total.....	.....	36,000	.....	7,674

¹ Counted but once.

The ingredient materials shown in Table II are mixed together at home on the barn floor with a shovel at an average cost of about 50 cents per ton. A total of about 28,500 pounds was applied to 18 acres, 1,500 pounds being used on the garden. In 1909 the cost of these ingredients, f. o. b. the farm, was \$34.18 per ton, or \$25.63 per acre. The quantity of commercial fertilizer used is being reduced each year, as the great improvement of the farm in fertility makes its use less necessary. In 1910 only 1,200 pounds were used and the yield was above the average.

CULTIVATION.

The cultivator is started in the potato field within a week after the beginning of planting, the teeth being set wide apart and the potato ridges followed as a guide. The object of this cultivation is to break up the middles between the rows which have been pressed down by the roller, by the horses, and by the wheels of the planter. For this cultivation straight teeth 2½ inches in width are set at a depth of about 3 inches. A week later a second cultivation is made, a smaller number of the same kind of teeth, set at a depth of 5 to 6 inches, being used. At least two cultivations are made before the potatoes are up, care being taken to keep away from the potato row so as not to disturb the tubers. A 2-row pivot-wheel riding cultivator is used. After the third or fourth cultivation, or as soon as the potatoes are well up, a weeder is run over the rows crosswise and again lengthwise. This last time over, the weeder pulls the plants straight into the row and facilitates cultivation. During the third and fourth cultivations the machine is adjusted with 1½-inch teeth next to the row in order to do close work. The other teeth are set the same as at first. At the fifth cultivation, 7-inch side steels throw a small, sharp ridge of soil directly on the potato row and the soil next to the row in order to bury and smother any weeds escaping previous cul-

tivations. The spike-tooth harrow which was formerly used to clean out these weeds was found to be too rough on the plants in this soil. All the remaining cultivations (there are usually 10 or 12) are made with the same teeth as are used in the fifth, gradually widening the space next the row as the vines develop. A tooth set ahead of the gang bar on each side prevents the wheels from running on the plants. Two hand weedings are made during the season, one about July 15 and the other about August 25, in order to get any weeds which may have escaped the cultivator. The ground is so clean that a man can pull the weeds on from 1 to 4 acres in a day.

SPRAYING.

Spraying is a very important item in the growing of a crop of potatoes on this farm. The watchword is thoroughness. The sprayer used is a 2-wheeled, 1-horse, homemade affair.¹ The power is supplied by a double-acting force pump having a large air chamber and equipped with a relief valve, pressure gauge, revolving agitator, etc. This pump develops and maintains 75 pounds of pressure, which the relief valve regulates. Unless otherwise desired, the sprayer covers six rows at a time and six Bordeaux nozzles are brought to bear, one on each row. Two central nozzles spray backward under the machine; all the rest are directed ahead. The nozzles are so arranged that the operator can adjust them from his seat without stopping the machine. The balance of the machine is secured by placing the tank over and a little back of the axle. The operator's seat is on the tank.

The 5-5-50 Bordeaux formula² is used, but the particular strength of the mixture is not regarded as being so important as that it is applied vigorously, liberally, and on time. Paris green is the insecticide used, and is applied at the rate of $1\frac{1}{2}$ pounds per acre. None but chemicals with a guaranteed analysis are purchased. Stock solutions of copper sulphate and of lime water are kept in readiness. The tank is filled from the small stream which runs through the farm. The mixture is always tested before being applied, and an excess of lime is used. Emphasis is laid upon having the material well mixed.

As a rule each application is made in opposite directions on the rows or, if an application is made in only one direction, the next time over it is made in the opposite direction. During the first spraying the nozzles are directed downward in the center of the row at an angle of 45 degrees. Before the rows meet, usually in mid-July, the nozzles are swung to the left and downward at the same angle. Next, the nozzles are swung to the right and downward. Again, the nozzles are set straight and downward at an angle of 45 degrees. The

¹ In 1910 a modern, 2-horse, 100-gallon machine was purchased.

² Five pounds of copper sulphate (blue vitriol) and 5 pounds of lime to 50 gallons of water.

owner says that "this plan requires three double or six single opposite applications to complete the cycle and gives the operator the important advantage of getting at the potato plant—attacking the enemy from six different positions or angles, thereby forcing the copper plating on every part of the potato plant from top to bottom."

In 1908 the first application of spray was made on June 23 and the last on September 4. During the five weeks following the middle of July, the period of maximum growth, 125 to 150 gallons of Bordeaux mixture per acre were applied each week. The owner believes thoroughly in frequent and light applications, and points out that an acre of good potatoes at maximum growth makes from 2 to 3 or more acres of vine and leaf area during this period.

The extent of spraying done may be considered excessive by many, but the owner has found in a careful test that it pays. He has secured a good profit from the sprayed rows over the unsprayed rows. We will let him give these results in his own words, as recorded in the Rural New Yorker of May 22, 1909:

According to carefully conducted tests the past season, the central row of a three-row check (not sprayed) yielded at the rate of 137 bushels potatoes per acre. Sprayed potatoes adjoining, where 1,427 gallons of Bordeaux were applied per acre, yielded 240 bushels of better stock—an increase of 103 bushels by spraying, and the total cost was \$13 per acre. Some may say this is excessive, but a further test was made. Two separate rows were double sprayed, or 2,854 gallons of Bordeaux were applied, and the yield in each case was 278 bushels per acre. The spraying cost double, or \$26 per acre. The increase was 38 bushels, which cost \$13. This paid too, both in satisfaction and from a business standpoint. Figuring our annual 18 acres at 103 bushels per acre increase from spraying, at 60 cents per bushel, less cost of spraying, a net profit of \$878.40 would be realized. Does it pay? For several years similar tests and results have been made and realized.

DIGGING AND MARKETING.

A digger is used in harvesting the tubers (fig. 6). The potatoes are picked up by men and boys into bushel crates, which are manufactured on the farm from purchased timber sawed at a nearby mill. In an average year from 12 to 15 pickers will keep up with the digger and haul each day's digging to the cellar. In the early days 150 bushels were regarded as a good day's digging, but now, with improved machinery and methods, 1,000 to 1,200 bushels are handled in a day. On one day in 1906, 1,500 bushels were dug, picked, and hauled—1,000 bushels 1 mile to the station, the remainder to the barn. Twenty-three pickers, including 10 girls and boys, were required to do the work. The tubers are stored in the house cellar as far as possible, particularly the seed-plat stock. This cellar holds about 2,500 bushels. The barn is used to store the remainder of the crop; stock stored in the latter place must be removed before the temperature goes lower than 20° F.

COST OF GROWING.

Some will undoubtedly think that the cost of growing potatoes on this farm is excessive and that there is no profit when so much expense is entailed. The following is a careful estimate made by the owner of the farm and the writer, which shows a net profit of \$39.33 per acre, or 14 cents per bushel, besides 6 per cent interest on the land and equipment. This estimate is based on expenses during the last three years, which are a little high for the whole nine-year period, and on the average yield and price for the last nine years.



FIG. 6.—Potato harvest on the farm, showing the digger in operation and pickers at work.

TABLE III.—*Cost per acre and per bushel of growing potatoes on the farm for the nine years, 1901-1909.*

Items of expense.	Cost per acre.		Cost per bushel.
	Separate items.	Total.	
			<i>Cents.</i>
Plowing.....	\$3. 00		
Preparation of land.....	2. 00		
Planting.....	1. 00		
Cultivating (14 times).....	6. 30		
Spraying.....	6. 30		
Harvesting.....	7. 00		
Marketing.....	3. 00		
Cost of labor.....		\$28. 60	10. 2
Seed (22 bushels at 42.4 cents).....	9. 32		
Fertilizers (1909 figures).....	25. 63		
Spraying material (1908 figures).....	6. 00		
Use of equipment (\$28 per acre at 6 per cent).....	1. 68		
Interest (6 per cent on land, \$150, or rental value).....	9. 00		
Cost of seed, fertilizer, equipment, etc.....		51. 63	18. 2
Total cost.....		80. 23	28. 4
Receipts.....		119. 56	42. 4
Net profit.....		39. 33	14. 0

INCOME.

The income from the potato crop is an interesting feature of this account, because it is more or less the measure of the success of the methods practiced. The following table gives the total and average yield per acre for 18 years. During the first 9 years the crop averaged 132 bushels per acre. In 1900 drainage and better methods began to make themselves felt and the yield steadily increased. During the last 9 years the annual average from 18 acres has been 282 bushels per acre. This is an increase of 150 bushels per acre for the last 9 years over the 9 years from 1892 to 1900. During the last 5 years it has averaged 295 bushels per acre. The average yield for the whole 18 years, during which 373 acres have been cultivated and 73,558 bushels have been grown, is 197 bushels per acre. In 1910 the yield was 328 bushels per acre, which was considerably above the average and shows that the farm is still improving. Good farming tells.

TABLE IV.—*Potato yields for 18 years on the farm.*

Years.	Acres.	Yield in bushels.		Years.	Acres.	Yield in bushels.	
		Total.	Average per acre.			Total.	Average per acre.
1892.....	12	1,200	100	1901.....	18	4,570	254
1893.....	25	2,525	101	1902.....	18	4,680	260
1894.....	26	3,063	118	1903.....	18	4,718	263
1895.....	22	3,065	139	1904.....	18	5,090	283
1896.....	30	4,186	140	1905.....	18	4,825	268
1897.....	30	3,500	117	1906.....	18	7,510	417
1898.....	30	5,180	173	1907.....	18	5,425	301
1899.....	18	2,353	131	1908.....	18	4,200	233
1900.....	18	2,868	164	1909.....	18	4,600	256
9-year average, 1892-1900.....	211	27,940	132	9-year average, 1901-1909.....	162	45,618	282
				18-year average..	373	73,558	197

LIVE STOCK.

This farm is a good example of the maintenance of fertility with the use of a very few live stock, only six head being kept on 58 acres, or about one to each 10 acres. The two cows, which are Jerseys, are stall-fed on clover hay. They are fed 5 quarts of bran and corn meal, equal parts by weight, twice during each day except in the summer. During the winter and until May 1 they are also fed beets twice a day. From 150 to 300 bushels of beets are grown for this purpose. During the summer the cows are staked out on a part of the meadow or the roadside. These two cows supply the milk and butter for the family and considerable to sell besides.

The team work on the farm is done by four horses, which average about 1,300 pounds each. These horses are never pastured, but are kept up in stalls the entire time. During the working season they are fed, in addition to clover hay, 6 quarts of oats three times a day,

350 bushels of oats being purchased each year and ground at the mill for this grain ration. During the winter the horses receive no grain, but only clover hay.

LABOR.

The work on this farm is performed by two men, one of whom receives \$32 per month for eight months, \$20 for December, \$10 per month for January and February, and \$20 for March, together with board. The other man is employed for eight months at \$1.50 a day and board. In addition to this, extra day men are hired as needed. They are mostly required in potato harvesting. The owner is a hard worker and does a large part of the work on the farm himself. He attends personally to all such work as the seeding of clover and the planting and spraying of potatoes. This has been the case until the past year, 1910, when he removed from the farm to take charge of the farms of a railroad company. Now a manager is employed to take the owner's place. The other labor remains the same.

THE MEASURE OF SUCCESSFUL FARMING.

The average farmer is altogether too prone to measure success in farming entirely from the dollars and cents standpoint. A good net income is but one of the factors of success on a farm. A comfortable home, convenient and efficient buildings and equipment, and more fertile and productive land are certainly equally important factors. Successful farming may be defined as that which gives maximum cash-crop returns, ordinary home comforts and conveniences, efficient economic administration, and at the same time leaves the land in an increased state of fertility and productiveness. Let us see how this farm measures up to this standard.

THE FARM INCOME.

A complete table of the income for each of the 18 years during which the present owner has operated this farm follows. In this table it appears that the average total receipts for the nine years from 1892 to 1900 were \$1,094.40, made up as follows: Potatoes, \$861.52; wheat, \$73.37; hay, \$17.62; butter and eggs, \$76.83; and miscellaneous, \$65.06. Compared with this is the average income during the nine years from 1901 to 1909, which was \$2,786.33, made up of potatoes, \$2,115.82; wheat, \$258.53; hay, \$60.61; butter and eggs, \$71.94; and miscellaneous, \$279.43. Some remarkable increases are shown. The potato income¹ increased 145 per cent, the wheat income 252 per cent, and the total income 155 per cent. The income

¹ A factor in this greatly increased income from potatoes has undoubtedly been the increase in the average price of potatoes. From 1892 to 1900 the price ranged from \$0.095 in 1895 to \$0.509 in 1897, and averaged \$0.292 per bushel. From 1901 to 1909 the price ranged from \$0.273 in 1904 to \$0.578 in 1908, and averaged \$0.424 per bushel. The selling price for the last 9-year period averaged \$0.132 more per bushel than the preceding 9-year period. The average price for 18 years is \$0.358 per bushel. Much the same is true of wheat prices.

from butter and eggs remained about the same, but the income from miscellaneous sources was increased four times, principally due to the sale of orchard and garden products. The amount of the income is not so remarkable as the increase of the last nine years over the preceding nine years.

TABLE V.—*Sales of produce from the farm, 1892–1909.*

Year.	Potatoes.	Wheat.	Hay.	Butter and eggs.	Miscellaneous.	Total.
1892.....	\$497.30	\$68.51	.....	\$121.56	\$90.00	\$777.37
1893.....	895.44	73.00	.....	207.96	44.50	1,220.90
1894.....	811.31	¹ 41.56	.....	101.96	20.93	975.76
1895.....	291.77	¹ 21.50	.....	86.77	15.00	415.04
1896.....	493.17	¹ 51.00	.....	43.85	117.00	705.02
1897.....	1,781.00	¹ 80.00	.....	26.16	150.00	2,037.16
1898.....	1,469.91	97.53	.....	25.28	50.00	1,642.72
1899.....	796.80	48.34	\$113.83	47.42	55.14	1,061.53
1900.....	717.00	178.92	44.74	30.54	42.86	1,014.06
9-year average.....	861.52	73.37	17.62	76.83	65.06	1,094.40
1901.....	2,214.69	92.22	226.00	27.28	350.00	2,910.19
1902.....	1,652.48	236.00	78.00	44.42	59.48	2,070.38
1903.....	2,288.80	404.50	.....	37.19	107.50	2,837.99
1904.....	1,391.26	166.17	17.00	95.20	153.60	1,823.23
1905.....	2,265.80	236.19	.....	54.01	395.23	2,951.23
1906.....	2,525.00	172.00	48.00	121.75	182.57	3,049.32
1907.....	2,807.89	156.00	85.47	110.35	393.96	3,553.67
1908.....	2,428.54	148.68	.....	66.58	536.83	3,180.63
1909.....	1,467.93	715.00	91.00	90.68	335.77	2,700.38
9-year average.....	2,115.82	258.53	60.61	71.94	279.43	2,786.33
18-year average.....	1,488.67	165.95	39.11	74.33	172.25	1,940.36

¹ Rye instead of wheat.

Unfortunately, it is impracticable to get as accurate a statement of expenses as we have of receipts. While a daybook has been kept during the whole period of 18 years, the items of expense are so confused with personal, family, and other expenses that they can not be separated without a vast amount of labor. Therefore it has been necessary to resort to estimates. These have been as carefully made as possible, being compared with the items in the daybook for some years, where these are clear.

TABLE VI.—*Expenses of the farm, 1892–1909 (estimated).*

Period.	Labor.	Seed.	Feed.	Fertilizer.	Taxes and insurance.	Spraying material.	Depreciation and repairs.	Miscellaneous.	Total.
9 years, 1892–1900.....	\$400	\$50	\$100	\$100	\$30	\$40	\$100	\$60	\$880
9 years, 1901–1909.....	600	75	200	500	40	110	150	100	1,775

It will be noted that while expenses have increased, this increase has not been in proportion to the increase in receipts. During the second 9-year period the average expenses increased \$895, or 102 per cent over the average for the first nine years, while the receipts

increased \$1,691.93, or 155 per cent, during the same period. Thus, the owner's profit, which represents his interest on investment and salary, was \$796.93 greater during the second nine years than during the first nine years. To put it another way, allowing the owner a salary of \$300 a year, his interest on the investment of \$10,000, or about \$175 per acre, increased from -0.8 per cent to 7.1 per cent.

The profitableness of this farm may be measured in another way. The owner began with a debt of \$3,000 on the land and several hundred dollars on the equipment. All indebtedness has been paid. In addition, a tile drainage system costing \$2,500 has been put into operation on the farm. The farm, shop, and house equipments have been increased to the maximum of efficiency. These and other improvements have doubled the cash value of the farm and have left a considerable cash balance in the bank. All this must be credited to 18 years of good farming, which may be called fairly successful financial management.

CONDITION OF THE FARM.

The productivity of the soil has been greatly improved and its physical condition made nearly perfect. The plowing under of so much clover and wheat straw has added no small amount of plant food. Together with the judicious use of commercial fertilizers, the plant food added has probably been somewhat in excess of that removed by crops, thus creating what might be called a reserve fund of fertility. Tile draining and green manures have so drained and aerated the soil that its physical condition could hardly be improved.

The soil is an ideal one for wheat and hay, but is rather heavy for potatoes. Only the greatly improved condition of the soil has made good crops possible. The yield of wheat shows an average increase of 5.2 bushels per acre for the last nine years over the preceding nine years; of potatoes, an average increase of 150 bushels per acre for the same period; and of hay, more than double the previous yields. These crop increases are the best evidence of the increased productive power of the soil, which has probably been more than doubled. Moreover, the farm has just reached this condition of maximum production, and from now on a higher average will undoubtedly be obtained on all crop yields. The farm, rather than a bank, has been the depository of profits and has returned good interest.

THE HOME.

A pleasant and comfortable home is certainly a big asset in any business. This feature has not been neglected on this farm, which contains all the comforts and conveniences of the better farms (fig. 7). In this, as in all the struggles of these 18 years, the farmer has had the efficient aid of a capable, hard-working, and patient wife, to whom should be given a full share of the credit for what has been accomplished.

THE GARDEN AND ORCHARD.

The importance of the garden as a farm asset can hardly be over-estimated. Ordinarily, in estimating a farmer's profits we fail to consider that the garden supplies a large part of his living. As a matter of fact, the farmer's income should be credited with the difference in the cash cost of running his family table and that of the man who has no garden. Yet the average farmer's garden does not receive the attention which it should have. All other farm work usually comes first and the garden is neglected. Most farmers will not take the time to care for the garden properly when it interferes with other farm work. Often not more than a few hours' work would be necessary to put the garden in proper condition, when lack of this attention

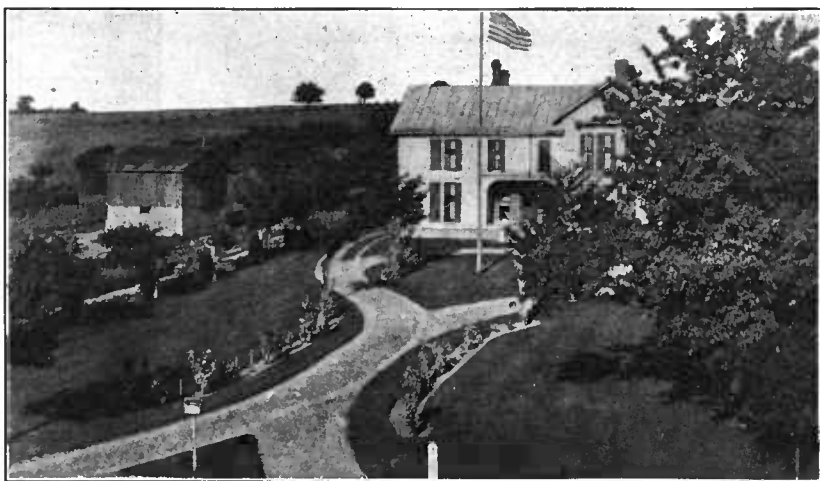


FIG. 7.—House, lawn, and part of the garden on the farm.

would mean the purchase of vegetables or fruit. The farm garden is a real asset, a productive enterprise, and should be so regarded.

On this farm the owner has demonstrated that the garden may not only be made to furnish the family with fruit, flowers, and vegetables during the greater part of the year, but that it may do this without interfering with the regular farm work. In other words, he has proved that a model garden and orchard and maximum crop yields are compatible. Moreover, on this farm the garden has actually returned a cash profit, from \$50 to \$200 worth of products having been sold from the garden each year for several years.

THE VEGETABLE GARDEN.

In order to give the maximum of efficiency, a garden must be carefully laid out. Reference to the map in figure 8 will show that this one, which is three-fourths of an acre in extent, has been very carefully planned. Each spring each vegetable is assigned a definite row or

mid-June and are followed in succession by currants, black raspberries, red raspberries, blackberries, gooseberries, plums, pears, peaches, prunes, apples, grapes, and quinces. In order not to have any gaps between the different fruits, early, midseason, and late varieties of each fruit were planted. For example, the earliest ripening strawberry on his soil and under his conditions is Glen Mary. This is closely followed by Bubach and Ridgway, Brandywine, the latest variety, closing the strawberry season just as the earliest of the black raspberries are beginning. The same plan is followed with several other fruits. The ground is as fully occupied as possible. Vegetables are grown between the rows of berries where practicable. The raspberries are held up by wires. Grapes are

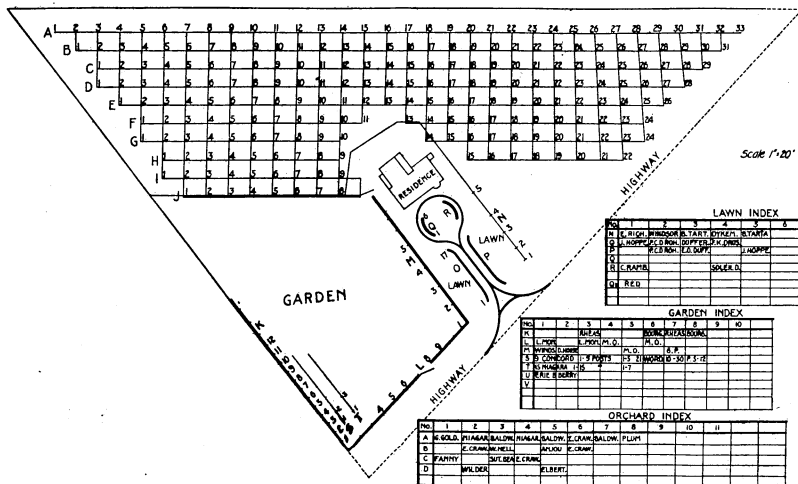


FIG. 9.—Diagram showing the orchard, lawn, and garden on the farm, with an index of each.

trained on an overhanging cross-arm trellis, and gooseberries, which thrive in the shade, are set under this arbor.

THE ORCHARD.

The main orchard as shown in the map (fig. 9) is separate from the garden. It is composed principally of apple trees set 30 by 40 feet apart interplanted with pear and peach trees, thus making the trees stand 15 by 20 feet apart. As with the small fruits, these tree fruits are of many varieties, beginning with the earliest summer apples, pears, and peaches and continuing in succession through the season to the latest varieties. Reference to the keys accompanying the maps will show what these varieties are. They may not be adapted to other soils and conditions as well as to those of this farm. The orchard, which consists of 2 acres of land, has been cropped in the regular rotation up to the present time, the fertility of the soil being maintained in the same way as that of the remainder of the farm.

FLOWERS.

Still another feature of the garden should be mentioned—the flowers. Every year a pyramidal bank of red and white flowers, running the whole length of the garden, is grown. These are arranged in long rows of color, the highest growing flower in the middle, a medium high one next, then a still lower growing one on each side. The aim is so to time the planting that they will bloom together, when they are a beautiful sight.

Thirty varieties of roses¹ are grown in the front yard, which is neatly kept and well arranged. The owner can tell you the name and merits of each of these varieties, as also of the several varieties of peonies growing here. He takes the keenest pleasure in watching and studying these flowers and discussing them with visitors. They contribute no small amount to the sum of enjoyment of life on this farm.

THE SMALL-TOOL EQUIPMENT.

One other department of this farm is worthy of particular mention. In the fore part of this account it was noted that the owner was of a mechanical turn of mind. In following out this liking he has accumulated one of the most complete sets of small tools the writer has ever seen. Mechanic, carpenter, and plumbing tools of every kind which might be of use on the farm, either in making new articles or in repairing old ones, make up this equipment. These include saws, measuring tapes and tools, hammers, wrenches, punches, pliers, braces, sets of bits of different sizes, files, rivets, screws, blacksmith's and woodworker's vises, a foot-power lathe, a forge, an anvil and forge equipment, and many other useful tools. A complete list of these articles with their original cost follows. The inventory totals \$332.54, which is probably 25 per cent more than the tools would have cost had they been purchased all together at wholesale rates. Mr. Martin has been accumulating these tools during 18 years and has paid full retail prices for most of them.

In addition to this set of small tools, the repair shop contains a complete set of carriage, machine, and stove bolts in assorted sizes from the smallest to the largest which might be wanted on the farm, numbering 3,303 as inventoried September 1, 1910, and valued at about \$35. Besides these, a full supply of bolts, washers, and small parts of the different makes of machines used on the farm is kept on hand. This obviates the necessity of dropping work and going to town after broken or lost parts of implements, which consumes so much time on the average farm.

One afternoon during potato harvest in 1908, when the writer happened to be visiting the farm, an incident occurred which illustrates very well the value of this repair and supply outfit. The short

¹ A full account of these roses and their culture may be found in the Rural New Yorker of November 13, 20, and 27, 1909, vol. 68, pp. 981, 1002, and 1022.

beam of the potato digger was broken in turning the machine. Fourteen men were picking up potatoes, while a team and two other men were hauling. The pickers were not far behind the digger and in half an hour or less would have caught up and been idle. But there was an extra part in the farm shop, and, calling one man to his assistance, the owner quickly unhitched the team and with the required tools at hand removed the broken beam, replaced it with a new one, and resumed digging before the pickers caught up. Unknown to him, the writer had held the watch, and the whole delay consumed but 25 minutes. On many farms this accident would have stopped all work for at least the rest of the day and cost more than the price of the broken part and the repair tools in idle labor and delay of work.

These tools and extras are housed in a convenient repair shop in one end of the barn, where they are neatly and orderly arranged in cases and boxes or hung on the walls. Everything has its place, and the owner's aim is to keep it there if possible.

Some will consider many of these tools unnecessary and superfluous, and some of them doubtless are. But the retail cost of the entire outfit is only about \$350, which is not a large sum. The interest on this amount at 6 per cent is only \$21 a year, and it is safe to say that there has never been a year when twice this amount was not saved by them in time, labor, and cash. The average farmer has a far larger repair bill than this amount of interest and upkeep. While the average man will undoubtedly not require as many tools as this, yet here is an example which can very well be followed by many farmers to their comfort, convenience, and financial advantage.

List and cost of mechanics', machinists', and plumbing tools, etc., on the farm.

	Cost.		Cost.
2 Hand cut-off saws, 26-inch....	\$3. 00	1 Nail puller.....	\$0. 50
2 Hand rip-saws, 28-inch.....	3. 00	1 Broadax.....	1. 00
2 Hand keyhole saws.....	. 50	2 Combination monkey and pipe	
1 Hack saw, 10-inch.....	. 75	wrenches, 15-inch.....	3. 50
24 Blades, 10-inch.....	1. 00	7 Twin alligator wrenches, 8-inch	3. 50
1 Square, 2-foot.....	1. 50	1 Alligator wrench, 20-inch....	1. 00
2 Try-squares, 6 and 10 inch....	. 70	6 Assorted wrenches.....	1. 00
2 Bevel squares, 10-inch.....	. 50	6 Assorted cold chisels.....	1. 00
1 Tape measure, 75-foot.....	. 75	6 Assorted cold punches.....	. 75
1 Compass, 10-inch.....	. 60	4 Nail sets.....	. 25
2 Calipers, 6-inch.....	. 75	2 Center punches.....	. 20
2 Marking gauges.....	. 50	2 Prick punches.....	. 20
2 Claw hammers.....	1. 00	4 Rivet sets.....	. 75
2 Cross-peen riveting hammers..	1. 00	4 Screw drivers.....	1. 00
1 Blacksmith's cross-peen ham-		1 Tool handle.....	1. 25
mer.....	. 50	1 Pair button pliers.....	. 50
1 Blacksmith's ball-peen ham-		1 Pair lineman's pliers.....	. 50
mer.....	. 50	1 Pair parallel-jaw pliers.....	1. 50
1 Shoeing hammer.....	. 40	2 Pairs small pliers.....	. 75
1 Rawhide mallet.....	1. 25	1 Pair round-nose pliers.....	. 50

	Cost.		Cost.
1 Pair end nippers.....	\$1. 50	Post drill, upright, self-feed, and quick return.....	\$10. 00
1 Pair three-fourths bolt cutters.....	5. 00	One-half inch straight round- shank drills, $\frac{1}{8}$ -inch, $\frac{3}{16}$ -inch, $\frac{1}{4}$ -inch, $\frac{5}{16}$ -inch, $\frac{3}{8}$ -inch, $\frac{7}{16}$ - inch, $\frac{1}{2}$ -inch, $\frac{5}{8}$ -inch, $\frac{3}{4}$ -inch, $\frac{7}{8}$ -inch, $\frac{1}{2}$ -inch, $\frac{3}{4}$ -inch, $\frac{1}{2}$ -inch, $\frac{3}{8}$ - inch, $\frac{1}{4}$ -inch, $\frac{3}{16}$ -inch, $\frac{1}{8}$ -inch.....	10. 63
1 Pair hog ringers.....	. 25	Complete set reamers bit brace, $\frac{1}{8}$ -inch, 25 cents; $\frac{1}{4}$ -inch, 30 cents; $\frac{3}{8}$ -inch, 35 cents; $\frac{1}{2}$ -inch, 40 cents; $\frac{5}{8}$ -inch, 45 cents; $\frac{3}{4}$ - inch, 50 cents; $\frac{7}{8}$ -inch, 60 cents; $\frac{1}{2}$ -inch, 70 cents; $\frac{3}{4}$ -inch, 80 cents; 1-inch, 90 cents; $1\frac{1}{8}$ -inch, \$1.10.....	6. 35
1 Pair gas tongs.....	. 40	1 Burring reamer, $\frac{1}{2}$ to $1\frac{1}{4}$ inch ..	. 75
1 Pair pulling tongs.....	1. 50	2 Iron countersinks.....	. 40
1 Pair cutting nippers.....	1. 50	2 Brace screw-driver bits.....	. 25
2 Pairs pruning shears.....	1. 50	Several extra bits, drills, reamers, etc.....	2. 00
1 Parallel-jaw 6-tube punch.....	1. 50	Chisels, socket firmer, $\frac{1}{8}$ -inch, 30 cents; $\frac{1}{4}$ -inch, 30 cents; $\frac{3}{8}$ -inch, 30 cents; $\frac{1}{2}$ -inch, 35 cents; $\frac{5}{8}$ -inch, 40 cents; $\frac{3}{4}$ -inch, 40 cents; $\frac{7}{8}$ -inch, 40 cents; 1-inch, 45 cents; $1\frac{1}{4}$ -inch, 45 cents; $1\frac{1}{2}$ - inch, 50 cents; $1\frac{3}{4}$ -inch, 50 cents; 2-inch, 55 cents.....	4. 90
1 Saw set.....	. 60	Gauges, $\frac{1}{4}$ -inch, 30 cents; $\frac{1}{2}$ -inch, 40 cents; $\frac{3}{4}$ -inch, 50 cents; 1- inch, 75 cents.....	1. 95
1 Crosscut-saw set.....	1. 00	Wood planes: Smoothing plane, 40 cents; jack plane, 60 cents; jointer, 75 cents; long jointer, \$1	2. 75
1 Pair tin snips.....	1. 75	Iron planes: Two-inch smooth- ing, \$2; 3-inch scraper, \$1.50; $1\frac{1}{2}$ -inch bull-nose rabbit plane, \$1; plane hollows and rounds, \$10; circular plane, \$2.25; router, \$1.50; 1 small bull-nose plane bader, 25 cents; 1 small block plane, 25 cents; 1 leader, 50 cents.....	19. 25
1 Pair bent snips.....	1. 75	1 Level (iron) and sights.....	2. 50
2 Scrapers.....	. 25	1 Level, wood.....	1. 00
1 Sweep brace, 16 inch.....	2. 50	1 Leather gauge knife.....	1. 00
Complete set bits, $\frac{1}{8}$ -inch, 25 cents; $\frac{1}{4}$ -inch, 25 cents; $\frac{3}{8}$ - inch, 30 cents; $\frac{1}{2}$ -inch, 30 cents; $\frac{5}{8}$ -inch, 35 cents; $\frac{3}{4}$ -inch, 40 cents; $\frac{7}{8}$ -inch, 40 cents; $\frac{1}{2}$ -inch, 45 cents; $1\frac{1}{8}$ -inch, 50 cents; $\frac{3}{4}$ - inch, 55 cents; $1\frac{1}{4}$ -inch, 60 cents; 1-inch, 65 cents; $1\frac{1}{2}$ - inch, 70 cents; $1\frac{3}{4}$ -inch, 80 cents; $1\frac{5}{8}$ -inch, 85 cents; $1\frac{1}{2}$ - inch, 90 cents.....	8. 60	1 Oilstone.....	. 25
1 Expansive auger bit, $\frac{7}{8}$ to $3\frac{1}{2}$ - inch.....	. 65	1 Double carborundum stone...	1. 25
1 Car bit, $\frac{7}{8}$ -inch.....	. 75	1 Steel stamp, "T. E. M." .....	. 50
1 Wood countersink.....	. 30	1 Set numbers (steel).....	1. 00
1 Reamer for iron work.....	. 25	1 Steel burning stamp, "T. E. M.".....	. 75
1 Bit and square level.....	. 20		
1 Taper auger.....	2. 00		
1 Hollow auger.....	4. 00		
1 Spoke pointer.....	. 50		
1 Bit gauge.....	. 25		
2 Bit extensions.....	. 50		
1 Washer cutter.....	. 50		
1 Hand taper reamer.....	. 50		
Complete set brace, square-shank twist drills, $\frac{3}{16}$ -inch, 7 cents; $\frac{1}{4}$ -inch, 8 cents; $\frac{5}{16}$ -inch, 10 cents; $\frac{3}{8}$ -inch, 12 cents; $\frac{7}{16}$ - inch, 15 cents; $\frac{1}{2}$ -inch, 17 cents; $\frac{5}{8}$ -inch, 17 cents; $\frac{3}{4}$ - inch, 22 cents; $\frac{7}{8}$ -inch, 24 cents; $1\frac{1}{8}$ -inch, 27 cents; $\frac{3}{4}$ - inch, 31 cents; $1\frac{1}{4}$ -inch, 34 cents; $\frac{1}{2}$ -inch, 38 cents; $1\frac{1}{2}$ - inch, 41 cents; $\frac{3}{4}$ -inch, 44 cents; $\frac{1}{4}$ -inch, 60 cents; $\frac{5}{8}$ -inch, 68 cents; $1\frac{1}{8}$ -inch, 75 cents; $\frac{3}{4}$ - inch, 85 cents; $1\frac{1}{4}$ -inch, 90 cents; $\frac{7}{8}$ -inch, 98 cents; $1\frac{1}{8}$ - inch, \$1.10; 1-inch, \$1.20.....	10. 53		

	Cost.		Cost.
1 Set steel burning numbers, 0 to 10.....	\$1. 25	Flathead rivets, 2 pounds, $\frac{1}{4}$ by 1 inch; 2 pounds, $\frac{1}{4}$ by $1\frac{1}{4}$ inch; 1 pound, $\frac{1}{4}$ by $1\frac{1}{2}$ inch; 1 pound, $\frac{1}{4}$ by $1\frac{3}{4}$ inch; 1 pound, $\frac{1}{4}$ by $1\frac{7}{8}$ inch; 1 pound, $\frac{1}{4}$ by $2\frac{3}{8}$ inch; 2 pounds, $\frac{1}{4}$ by 3 inch....	\$0. 90
36 Sheets sandpaper.....	. 25	Wood screws, 100, $\frac{1}{2}$ -inch, 10 cents; gross, $\frac{3}{4}$ -inch, 15 cents; 100, 1-inch, 15 cents; 50, 1-inch, heavy, 10 cents; gross, $1\frac{1}{4}$ -inch, 25 cents; gross, $1\frac{1}{2}$ -inch, 30 cents; gross, $1\frac{3}{4}$ -inch, 35 cents; gross, 2-inch, 35 cents; gross, 2 $\frac{1}{4}$ -inch, 40 cents.....	2. 15
24 Sheets emery cloth.....	. 25	Roundhead nickel screws, 60, $1\frac{1}{8}$ -inch, 15 cents; 200 assorted spring keys, 75 cents.....	. 90
2 Pairs 6-inch iron clamps.....	. 50	Harness extras, buckles, snaps, rings, clips, staples, etc.....	2. 00
2 Pairs 10-inch iron clamps.....	. 80	1 Blacksmith's vise, 6-inch jaw.	10. 00
2 Pairs 12-inch wood clamps....	1. 00	1 Woodworker's vise, 5-inch jaw.	5. 00
2 Cylindrical gauges, $\frac{1}{16}$ to 3 inch	1. 00	1 Foot-power lathe, No. 10, 3-cone, back gear, 14 by 30 swing, longitudinal and cross feed.....	40. 00
1 Angle and circle board.....	50	1 Four-jaw, 6-inch chuck, universal or independent chuck..	10. 00
1 Screw plate, $\frac{5}{8}$ -inch, $\frac{3}{4}$ -inch, $\frac{1}{2}$ -inch, $\frac{3}{4}$ -inch, and 1-inch....	5. 00	6 Adjustable lathe cutters, 2 straight, 1 right, 1 left, 1 straight cutting off and 1 offset, and 1 inside-boring tool.....	12. 00
1 Pipe screw plate, $\frac{1}{4}$ -inch, $\frac{3}{8}$ -inch, $\frac{1}{2}$ -inch, $\frac{3}{4}$ -inch, 1-inch....	4. 00	1 Arbor, $\frac{3}{4}$ -inch.....	1. 50
1 Pipe cutter, $\frac{1}{8}$ to $1\frac{1}{4}$ inch.....	2. 00	9 Taper-shank twist drills, $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$, $\frac{7}{32}$, $\frac{1}{4}$, $\frac{9}{32}$, $\frac{5}{16}$	5. 00
3 Pipe cutters.....	. 30	1 Screw-pitch gauge, 7 to 36....	1. 00
6 Oil cans.....	. 60	1 Center gauge.....	. 40
3 Flat files, 14-inch, 45 cents; 2, 12-inch, 30 cents.....	. 75	5 Pounds small nails, 40 cents; spring wire, 25 cents.....	. 65
1 Half-round file, 14-inch, 25 cents; 1, 10-inch, half-round, 20 cents.....	. 45	1 Grindstone.....	5. 00
1 Square file, 10-inch, 15 cents; 3, 14-inch, round, 45 cents....	. 60	1 Swing horse.....	4. 00
2 Round files, 12-inch, 30 cents; 3, 6-inch, 25 cents; 3, 4-inch, 15 cents.....	. 70	1 Forge, anvil, and tools, etc....	35. 00
3 Three-cornered files, 8-inch, 25 cents; 5, slim, 8-inch, 40 cents; 3 heavy files, 6-inch, 25 cents; 2, 6-inch, 15 cents; 4, 5-inch, 20 cents.....	1. 25	1 Barrel castor machine oil, No. 1	10. 00
1 File brush, 20 cents; 1 steel brush, 60 cents.....	. 80		
Roundhead rivets: 5 pounds, $\frac{3}{8}$ by $\frac{1}{2}$ inch; 5 pounds, $\frac{3}{8}$ by $\frac{3}{4}$ inch; 2 pounds, $\frac{3}{8}$ by $\frac{1}{2}$ inch..	1. 20		
Tin flathead small rivets; 3 pounds assorted rivets.....	. 40		
Roundhead rivets, 12 pounds, $\frac{1}{4}$ by $\frac{1}{2}$ inch, 96 cents; 5 pounds, $\frac{1}{4}$ by $\frac{3}{4}$ inch, 40 cents.....	1. 36		
Roundhead rivets, 18 pounds, $\frac{1}{4}$ by $\frac{1}{2}$ inch, \$1.44; 21 pounds, $\frac{5}{16}$ by $\frac{1}{2}$ inch, 88 cents.....	2. 32		
			¹ 228. 64

¹ A few tools are not mentioned.

SUMMARY.

(1) This bulletin is the story of the struggles and successes of a plain New York farmer who remained on the farm through the "hard-times" period, and succeeded.

(2) The farm was an average one for the section and the owner had all the drawbacks of an ordinary farmer, such as indebtedness, lack of capital, run-down land, poor drainage, etc.

(3) The organization of this farm is the most striking thing about it, making it one of the best organized farms in the United States. A well-developed systematic plan was followed from the first and carried to success.

(4) This farm is thoroughly tile drained with more than 10 miles of tile, or 56 rods per acre, according to a systematic plan followed since 1897.

(5) The rotation is the simple one of wheat, clover, and potatoes. This is an excellent rotation, because it has two good cash crops and one fertility crop every three years.

(6) Wheat has averaged 25.6 bushels per acre for the past 12 years. The last six years show an increase of 5.2 bushels per acre over the previous six years.

(7) Clover is the key to the success of this rotation. From uncertain and poor stands it has become a certainty and averages 2 to 4 tons per acre for the first cutting. The second crop is usually plowed under.

(8) Potatoes are the money crop. The average yield per acre for the last nine years has been 282 bushels, as against 132 bushels for the preceding nine years, an increase of 150 bushels per acre, due to better drainage, seed selection, and better cultivation, fertilizing, and spraying methods.

(9) Successful farming should be measured not only by financial results but by the resultant productive condition of the soil, the farm home, and the farm equipment and conveniences.

(10) Measured by net income this farm may be called fairly successful. During the last nine years it has paid the owner an average net return of over \$700 per year, or 7.1 per cent on an investment of \$10,000, and an annual salary of \$300.

(11) A good farm home, an exceptionally fine garden, grounds, and home orchard, and a model small-tool equipment are also marks of success.

(12) Perhaps the most striking thing about this farm outside of its organization is the remarkable increase shown in the second 9-year period over the preceding 9-year period, due to the methods employed.

(13) This farm is a conspicuous example of model farming that pays. The secret of success is a well-developed systematic plan of organization well followed.